

I claim:

1. A radiation detector for homeland security comprising:

a substantially rigid structure;

a scintillating fiber mounted to the substantially rigid structure, the scintillating fiber having a first end and a second end; the scintillating fiber having a length of between about 8 inches and about 10 feet;

a light intensity measuring device mounted to the substantially rigid structure in a substantially relatively immovable manner;

coupling means for optically coupling the first end of the scintillating fiber to an active portion of the light intensity measuring device;

means for shielding the scintillating fiber from ambient light;

wherein the light intensity measuring device produces an output signal in accordance with an amount of light generated by the scintillating fiber;

wherein the substantially rigid structure comprises a substantially rigid opaque tube, the scintillating fiber being disposed inside the opaque tube with a longitudinal axis of the scintillating fiber extending in a direction away from the active portion of the light intensity measuring device, and wherein the light intensity measuring device comprises a photomultiplier tube attached to a first end of the substantially rigid opaque tube by

a light-proof connection.

2. The radiation detector as recited in claim 1, wherein the output signal from the light intensity measuring device is fed through an integrator circuit, which filters high frequency variations that may be included in the output signal of the light intensity measuring device, to an analog-to-digital converter for subsequent input to a digital signal processor.

3. The radiation detector as recited in claim 2, wherein a response time of the integrator circuit is between about 3 ms and about 1 second.

4. A system comprising the radiation detector as recited in claim 1, wherein the radiation detector is mounted to a support structure adjacent to an object travel path in such a manner that the longitudinal axis of the scintillating fiber extends transversely to a direction of movement of objects along the travel path.

5. A system comprising the radiation detector as recited in claim 1, wherein the radiation detector is mounted to a roadway between leading and trailing ramps in such a manner that the longitudinal axis of the scintillating fiber extends transversely to a direction of movement of vehicles on the roadway.

6. The system as recited in claim 5, wherein a length of the

scintillating fiber is approximately equal to a width of the roadway.

7. A system comprising the radiation detector as recited in claim 1, wherein the radiation detector is mounted to a moving vehicle for providing spatial radiation mapping of a large area.

8. The radiation detector as recited in claim 1, wherein the output signal from the light intensity measuring device is fed through a circuit which filters high frequency variations that may be included in the output signal of the light intensity measuring device.

9. The radiation detector as recited in claim 8, wherein the circuit comprises an RC low-pass filter circuit.

10. The radiation detector as recited in claim 9, wherein an RC time constant of the circuit is between about 0.001 sec and 0.4 seconds for minimizing any effects of solar radiation spikes.

11. The radiation detector as recited in claim 8, wherein the integrator circuit provides a system response time of between about 3 ms and about 1 second.

12. The radiation detector as recited in claim 1, wherein the output signal from the light intensity measuring device is fed

through an integrator circuit, which filters high frequency variations that may be included in the output signal of the light intensity measuring device, to a voltage-to-frequency converter and then to a sound generating device for producing an audible frequency with a pitch proportional to absorbed radiation dose-rate.

13. A radiation detector for homeland security comprising:

- a substantially rigid tube;

- a scintillating fiber mounted to the substantially rigid tube, the scintillating fiber having a first end and a second end; the scintillating fiber having a length of between about 8 inches and about 10 feet;

- a light intensity measuring device mounted to the substantially rigid tube in a substantially relatively immovable manner;

- coupling means for optically coupling the first end of the scintillating fiber to an active portion of the light intensity measuring device;

- means for shielding the scintillating fiber from ambient light;

- wherein the light intensity measuring device produces an output signal in accordance with an amount of light generated by the scintillating fiber;

- wherein a cross-sectional dimension of the scintillating fiber is approximately 5 mm and a longitudinal axis of the scintillating

fiber extends in a direction away from the active portion of the light intensity measuring device; and

wherein the output signal from the light intensity measuring device is fed through an integrator circuit, which filters high frequency variations that may be included in the output signal of the light intensity measuring device, and to an analog-to-digital converter for subsequent input to a digital signal processor.

14. The radiation detector as recited in claim 13, wherein the substantially rigid tube comprises a substantially rigid opaque tube, and wherein the scintillating fiber is disposed inside the opaque tube.

15. The radiation detector as recited in claim 14, wherein the opaque tube comprises a thin-walled aluminum tube.

16. The radiation detector as recited in claim 14, wherein the opaque tube has a rectangular cross-section.

17. The radiation detector as recited in claim 14, further comprising a substantially rigid support tube disposed and supported within the opaque tube, wherein the scintillating fiber is disposed within the support tube.

18. The radiation detector as recited in claim 14, wherein the light intensity measuring device comprises a photomultiplier tube

attached to a first end of the substantially rigid opaque tube by a light-proof connection.

19. The radiation detector as recited in claim 18, wherein the scintillating fiber is at least about 3 feet long.

20. The radiation detector as recited in claim 13, wherein the integrator circuit provides a system response time of between about 3 ms and about 1 second.

21. The radiation detector as recited in claim 13, wherein the integrator circuit provides a system response time of about 0.08 seconds.

22. The radiation detector as recited in claim 13, wherein the integrator circuit provides a system response time of about 0.8 seconds.

23. The radiation detector as recited in claim 13, wherein the integrator circuit comprises an RC circuit having an RC time constant of between about 0.001 seconds and about 0.4 seconds for minimizing any effects of solar radiation spikes.

24. A radiation detector for homeland security comprising:
a substantially rigid structure;
a scintillating fiber mounted to the substantially rigid

structure, the scintillating fiber having a first end and a second end; the scintillating fiber having a length of between about 8 inches and about 10 feet;

a light intensity measuring device mounted to the substantially rigid structure in a substantially relatively immovable manner;

coupling means for optically coupling the first end of the scintillating fiber to an active portion of the light intensity measuring device;

means for shielding the scintillating fiber from ambient light;

wherein the light intensity measuring device produces an output signal in accordance with an amount of light generated by the scintillating fiber;

wherein the substantially rigid structure comprises a substantially rigid opaque tube, and wherein the scintillating fiber is disposed inside the opaque tube, with a longitudinal axis of the scintillating fiber extending in a direction away from the active portion of the light intensity measuring device; and

wherein the output signal from the light intensity measuring device is fed through a low-pass filter which filters high frequency variations that may be included in the output signal of the light intensity measuring device, and to an analog-to-digital converter for subsequent input to a digital signal processor.

25. The radiation detector as recited in claim 24, wherein the

opaque tube comprises a thin-walled aluminum tube.

26. The radiation detector as recited in claim 24, wherein the opaque tube has a rectangular cross-section.

27. The radiation detector as recited in claim 24, wherein the light intensity measuring device comprises a photomultiplier tube attached to a first end of the opaque tube by a light-proof connection.

28. The radiation detector as recited in claim 27, wherein the scintillating fiber is at least about 6 feet long.

29. The radiation detector as recited in claim 24, further comprising a substantially rigid support tube disposed and supported within the opaque tube, wherein the scintillating fiber is disposed within the support tube.

30. A radiation detector for homeland security comprising:

- a substantially rigid structure;

- a scintillating fiber mounted within the substantially rigid structure, the scintillating fiber having a first end and a second end, a length greater than 8 inches and less than about 10 feet, and a cross-sectional dimension of at least 2.5 mm;

- a light intensity measuring device mounted to the substantially rigid structure in a substantially relatively

immovable manner;

coupling means for optically coupling the first end of the scintillating fiber to an active portion of the light intensity measuring device;

means for shielding the scintillating fiber from ambient light;

wherein the light intensity measuring device produces an output signal in accordance with an amount of light generated by the scintillating fiber; and

wherein the output signal from the light intensity measuring device is fed through a low-pass filter which filters high frequency variations that may be included in the output signal of the light intensity measuring device, and to an analog-to-digital converter for subsequent input to a digital signal processor.

31. The radiation detector as recited in claim 1, further comprising: a radiation absorber mounted at the second end of the scintillating fiber for modifying the directional anisotropy of the scintillating fiber.

32. The radiation detector as recited in claim 13, further comprising: a radiation absorber mounted at the second end of the scintillating fiber for modifying the directional anisotropy of the scintillating fiber.

33. The radiation detector as recited in claim 24, further

comprising: a radiation absorber mounted at the second end of the scintillating fiber for modifying the directional anisotropy of the scintillating fiber.

34. The radiation detector as recited in claim 30, further comprising: a radiation absorber mounted at the second end of the scintillating fiber for modifying the directional anisotropy of the scintillating fiber.

35. The radiation detector as recited in claim 30, wherein a response time of the low-pass filter is between about 3 ms and about 1 second.

36. A radiation detector for homeland security comprising:

- a substantially rigid structure;

- a substantially straight scintillating fiber mounted within the substantially rigid structure, the scintillating fiber having a first end and a second end, an axis, and a cross-sectional dimension of at least 2.5 mm;

- a light intensity measuring device mounted to the substantially rigid structure in a substantially relatively immovable manner;

- coupling means for optically coupling the first end of the scintillating fiber to an active portion of the light intensity measuring device;

- means for shielding the scintillating fiber from ambient

light;

wherein the light intensity measuring device produces an output signal in accordance with an amount of light generated by the scintillating fiber; and

wherein a radiation absorber, made from a radiation shielding material, is mounted on the radiation detector adjacent the second end of the scintillating fiber for modifying a directional anisotropy of the radiation detector, the radiation absorber being aligned with the axis of the scintillating fiber.

37. A radiation detector for homeland security as recited in claim 36, wherein the output signal from the light intensity measuring device is fed through a low-pass filter which filters high frequency variations that may be included in the output signal of the light intensity measuring device, and to an analog-to-digital converter for subsequent input to a digital signal processor.

38. A method of detecting dose-rate and direction of radiation for homeland security, comprising the steps of:

providing a hand-held, portable scintillating fiber radiation detector with directional anisotropy, the scintillating fiber radiation detector having a substantially straight scintillating fiber which defines a scintillating fiber axis;

manipulating the scintillating fiber radiation detector so that the fiber axis is non-aligned to a radiation source;

sensing a dose-rate of radiation emanating from the radiation

source when the fiber axis is non-aligned to the radiation source;

upon sensing a potentially hazardous dose-rate, effecting an alignment process by manipulating the scintillating fiber radiation detector in space until a minimum signal response from the scintillating fiber radiation detector is found; and

using a direction of the fiber axis when the minimum signal response from the scintillating fiber radiation detector is found to indicate generally or substantially a direction of the radiation source.

39. The method as recited in claim 36, wherein the directional anisotropy of the scintillating fiber radiation detector is established by the ratio physical length/radiation attenuation length for the scintillating fiber.

40. The method as recited in claim 36, wherein the directional anisotropy of the scintillating fiber radiation detector is modified by a radiation absorber which is disposed at one end of the scintillating fiber.